Patterns, Not Categories: Learning Across Incidents

Tanner Lund
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Watch for Patterns

What do you see that could apply to your own systems? (share in slack)
Categories Have Limitations

“Is a hot dog a sandwich?”
“Is the ocean a soup?”
Learning Across Incidents is Good™
Categories from danluu’s repository:
https://github.com/danluu/post-mortems

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But It’s Hard
A List of Post-mortems!

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Categories from danluu’s repository:
https://github.com/danluu/post-mortems
Do the categories serve us?

Or do we serve the categories?
Learning at Scale is Hard!

Outage Pattern Analysis and Dirty Data

Tanner Lund
Microsoft Azure SRE
2020 Hypothesis #2

“At least 50% of S4A incidents will have a high avoidability”

Avoidability being:

“How easily could S4A developers/operators have avoided this with pro-active work. Did we see it coming, and fail to act, or was this an unpredictable event? 1-5 scale, 1 being a very hard event to see coming, 5 being an inevitable event that was identified before it happened.”
“And??”
“What do you want me to do about it?”
Repeat Incidents
People are Built for Pattern Recognition
Jumping Into An Incident
Jumping Into An Incident
Jumping Into An Incident
Jumping into an Incident
Jumping into An Incident
Jumping into an incident
Christopher Alexander

Pattern Theory
Some Example Principles

- Strong Centers
- Levels of Scale
- Boundary
- Alternating repetition
- Positive space (complementarity)
- Good form
- Local symmetry
- Deep interlock (ambiguity)
- Contrast (difference)

- Gradient
- Roughness (individuality)
- Echoes (similarity)
- The void (open space)
- Simplicity and inner peace
- Non-separateness (connectedness)
Pattern Concept

Abstraction
<table>
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<th>Christopher Alexander (Architecture)</th>
<th>Rob Hopkins (Transition)</th>
<th>Peter Baumgartner (Education)</th>
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<tbody>
<tr>
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(Site Reliability)

- pattern name
- context
- solution
- ??

Thomas Leitner -
https://patternsofcommoning.org/working-with-patterns-an-introduction/
Mobility Corridor

...In a Polycentric Region, develop proper high-speed connections between the centers of the region as well as to other regions.

Problem-statement: There is a need for corridors that allow high-speed vehicular movement within and between cities. This need extends into the hearts of the cities. But these structures must not be allowed to sever and destroy the tissue of the city.

Discussion: Few structures have been more damaging to modern cities than freeways. Yet the solution of creating freeway bypasses on the outskirts of cities is equally disastrous — sapping the centers of commercial movement and activity, and at the same time generating new sprawling zones at the edges.

This is not a unique problem of the automobile age. Railways can be no less destructive of urban areas, and so can canals, rivers and other structures — in fact, any structure that significantly interrupts the connectivity and flow of pedestrians is likely to be problematic. But there are excellent examples of cities that have managed this problem, by separating the grades of the mobility corridors, and by creating a continuous fabric of connections across them. Examples can be seen in London, Paris, and many other mature cities.

The issue is not whether a mobility corridor is present, but whether the urban fabric surrounding it remains intact. This must be done carefully, maintaining a continuous, tight fabric with minimal intrusion of noise, emissions, and visual disorder. Examples like Place de l'Europe in Paris demonstrate the value of ample vegetation, fences and other screening devices. Some cities have simply taken their mobility corridors underground, like Oslo. Some cities bring buildings across the bridging structures, like the Ponte Vecchio in Florence.

One problem for many cities is the cost of excavation and retaining structures. One strategy to minimize this cost is a “balanced cut and fill” grade change, rising gently in the urban fabric to the edge of the mobility corridor, and then cut more deeply to accommodate travel lanes at a lower grade. A related strategy is to utilize existing natural
A related strategy is to utilize existing natural watershed grade changes, taking care to avoid water pollution from vehicle emissions and other toxic runoff. Because of the cost of excavation, many cities in recent decades have chosen the easier alternative, which is to raise highways and heavy transport tracks above the pedestrian urban fabric. But the evidence shows that there is a profoundly negative impact of such solutions on the urban life underneath them.²

Of course, it must be stressed that “mobility” is not just about high speed transportation, but about integrated mobility across multiple modes (see Walkable Multi-Mobility, 2.1). A coordinated strategy is needed to keep a balanced and integrated approach to mobility.³

Therefore: Do not push freeways, railways and other destructive activities to the edges of the city. Instead, find ways to integrate them into the urban fabric with minimal disruption, using careful grade-separating strategies. Assure that the streets above are continuous, walkable, and as protected as possible from negative impacts like noise and emissions. Plan for at least two major mobility corridors crossing each large urban area, and connecting to others.

Integrate mobility corridors into the network, maintaining a 400M Through Street Network across all interruptions, providing bridges and other connections...

notes


² The damaging effects of such structures has been discussed extensively, and perhaps most notably by Jane Jacobs in The Death and Life of Great American Cities (1961, New York: Random House). She referred to the consequences as “galloping gangrene.”

³ (This is just an example of one approach)

Not a “Runbook”
Not “Best Practices”
Patterns in Software

- Object-Oriented Programming
- “Design Patterns”

What about design patterns at the system level?
You Are (Part of) The System
Ward Cunningham

Wiki
“Technical Debt”
XP
Design Patterns (general)
Federated Decisions

Local Expertise
“Involve the customer in design”
They more clearly see the costs and trade-offs
Pair Programming

Spread expertise and reduce dependency
Dave Woods,
Richard Cook,
Others…
Woods' Theorem: As the complexity of a system increases, the accuracy of any single agent's own model of that system decreases rapidly.
Dave’s Homework

- Learn how to learn about patterns
- Identify some patterns
- Share patterns with each other!

II. PATTERN-CENTERED INQUIRY

“Each pattern describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem in such a way that you can use this solution a million times over, without ever doing it the same way twice.”

(Alexander et al., 1977, p. x)

Key insight—relationships captured in a pattern recur even as the elements that specify the pattern change.
The pattern is general but is expressed/instantiated in multiple different situations/settings.
Patterns generalize & transfer findings from one situation to others.
Patterns are a way of seeing things across multiple events we cannot see from one
Patterns of How Systems Adapt

“Write that down, write that down!”
Big to Small

Law → Pattern → Local Expression
Working at Cross Purposes

Law
Fragmentation Across Unit Boundaries

Team 1

Team 2

Team 3 (different timezone)

General Pattern

Something broken
Multi-Party Problem

General Pattern
Multi-Party Problem

General Pattern
Alex Elman & Sarah Butt: “Embracing the Multi-Party Dilemma: Learning From Incidents Across Company Boundaries”
Clumsy Automation

Pattern
Clumsy Automation

- The Sorcerer’s Apprentice
- Jimmy Neutron
- “To err is human. To propagate error to all server in automated way is DevOps” - DevOps Borat
- That-breakfast-making-machine-from-Chitty-Chitty-Bang-Bang
- Cleaning robot that cleans the wrong things
- “Ironies of Automation”
Workarounds

Pattern

Get work done

Rules
Pattern Priming

Recognize examples of patterns in your setting. Start noticing.
Pattern Finding

Discover patterns from the things you keep seeing.
Family home: a generic pattern with infinite variations

What’s an SRE example?
“The people affected should be involved in the design process”

Don’t throw work on a backlog unilaterally
https://patternsofcommoning.org/working-with-patterns-an-introduction/
Predictive Power

Does your theme or pattern help you predict? Identify something early? React appropriately to a situation?

Categories are generally XOR. We are not so rigid.
Share your expertise!

Pull things out of your experts’ heads and share them around to help others
Handout!

- Links to resources
- Some possible patterns
- Talks cited in this one
- MASSIVE SURVEY FOR COLLECTING PATTERNS
- My soundcloud link
- Contact information
What have you(r experts) noticed?

(Weak signals ok)